

II.—*Notes on the British Machilidæ, with Descriptions of Two new Species.* By ANNA J. REILLY, A.R.C.Sc.I., Royal College of Science, Dublin.

[Plates I.–V.]

IN Lubbock's 'Monograph of the Collembola and Thysanura' (1873) there are descriptions of *Machilis polypoda* and *Machilis maritima*, only two species of the Machilidæ being recognized in Great Britain at that period. Silvestri (1904) justified the establishment of the genus *Petrobius* by Leach (1809) for *M. maritima* by showing that *Machilis* has paired processes (gonapophyses or paramera) on both the eighth and ninth abdominal segments in the male, while *Petrobius* has these structures on the ninth segment only. Verhoeff (1910) established the genus *Halomachilis*, characterizing it by the following structural details:—apex of the mandible un-toothed, feelers without scales except on the two basal segments, tip of labial palp having many flattened sensory spines. These details prove this genus to be identical with *Petrobius*.

Many species of *Petrobius* have since been recorded; Oudemans (1886) described a Dutch insect which he called *Machilis maritima*, and which agrees in many respects with the new species *Petrobius vectensis* described in this paper. I am indebted to Mr. R. S. Bagnall and Mr. E. Popple, Berkhamsted, for these specimens of *P. vectensis*; they were collected near Shanklin, Isle of Wight. I am also indebted to Mr. P. A. Buxton, Trinity College, Cambridge, for some specimens of this species which were collected by him at St. Helen's, Isle of Wight.

The second species described falls into a new genus of the Machilidæ—*Petromachilis*. The specimens were collected in August 1911 at Wasdale Head, Cumberland, by Mr. J. W. Shoebottom, who sent them to Prof. G. H. Carpenter, Royal College of Science, Dublin, for description. Prof. Carpenter kindly asked me to describe these and the Isle of Wight insects mentioned above, giving me some help and instruction in methods of procedure.

The genus *Petromachilis* is intermediate between *Machilis* and *Petrobius*, agreeing with *Machilis* in having paired processes on both the eighth and ninth abdominal segments in the male, and with *Petrobius* in having no scales on the antennæ except on the two basal segments, while it is intermediate between the two genera with regard to the mandible.

It may be distinguished from the other British genus of Machilidæ, *Præmachilis*, Grassi, by the presence of two pairs of exsertile vesicles on the second to the fifth abdominal segments inclusive, *Præmachilis* having not more than one pair of vesicles on any abdominal segment.

Genus PETROBIUS, Leach (1809).

Petrobius vectensis, sp. n. (Pls. I. & II.)

Body-length 8 mm. (male). Feelers (incomplete) at least as long as the body; tail-processes (incomplete) also at least as long as the body. Feelers, cerci, and tail-process white-ringed. Paired ocelli dumbbell-shaped, less than a transverse diameter apart (Pl. I. fig. 2). Mandible with blunt apex (Pl. I. figs. 3 & 4 a). Maxilla with lacinia slightly shorter than galea (Pl. I. figs. 6 & 6 a). Palp having its six elongate segments with proportional lengths 6 : 8 : 10 : 11 : 11 : 10. In the eighth abdominal segment of the male the subcoxæ are produced into prominent rounded lobes (Pl. II. fig. 1). The ninth abdominal segment has the subcoxæ produced into small pointed processes (Pl. II. fig. 2). Gonapophyses not reaching quite to tips of subcoxæ. Penis projecting to about three-fourths length of stylet; stylets with long, acute, apical spines. In the eighth abdominal segment of female the subcoxæ are produced into acute processes projecting to about $\frac{1}{3}$ length of stylet. Ovipositor of female nearly as long as the cerci, which are less than half the length of the incomplete tail-process.

Loc. (1) Shanklin, Isle of Wight; collected by Mr. E. Popple, Berkhamsted, May 1913. (2) St. Helen's, Isle of Wight; collected by Mr. P. A. Buxton, Aug. 1912.

This species agrees with *P. brevistylis*, Carpenter (1913), in having the mandible with blunt truncated apex, and contrasts with *P. maritimus*, Leach (1809), the mandible of which is acute. It agrees in many of its characters with the Dutch insect which Oudemans designated *Machilis maritima* and described in his memoir (1886). Prof. G. H. Carpenter, in a paper on the "Irish Species of *Petrobius*" (1913), referred to the latter insect, pointed out that it is certainly not the true *maritimus* of Leach, and suggested *P. oudemansi* as an appropriate name for it. Oudemans, in his drawings, figures the lacinia of the maxilla much longer than the galea; but in *P. vectensis* the lacinia is slightly shorter than the galea, agreeing with *P. brevistylis*, Carpenter, while the penultimate segment of the maxillary palp is not twice

as long as the apical (as in *P. oudemansi*), but in the proportion $\frac{1}{11}$. The gonapophyses in the male do not reach the tips of the ninth abdominal subcoxæ, in this respect being similar to those of *P. oudemansi*; but the penis attains to about three-fourths the length of the ninth abdominal stylets. *P. vectensis* agrees with *P. oudemansi* and *P. brevistylis* in having prominent lobes on the subcoxæ of the eighth abdominal segment in the male.

A synopsis of the prominent features of the four species of *Petrobius* mentioned in this paper is given below:—

- | | |
|---|--|
| A. Eighth abdominal segment ♂ with subcoxæ not produced into prominent rounded lobes | [Leach.
<i>Petrobius maritimus</i> , |
| A ₁ . Eighth abdominal segment ♂ with subcoxæ produced into prominent rounded lobes. | . |
| B. Stylets of ninth abdominal segment ♂ relatively short and thick, with very short blunt apical spines; gonapophyses reaching to tips of subcoxæ. Penis very elongate, projecting beyond the stylets | [Carpenter.
<i>Petrobius brevistylis</i> , |
| B ₁ . Stylets of ninth abdominal segment ♂ relatively long and thin, with long acute apical spines; gonapophyses not reaching to tips of subcoxæ. | |
| C. Subcoxæ of eighth abdominal segment ♀ not produced into long pointed processes. Penis in ♂ attaining only to half the length of the ninth abdominal stylets | <i>Petrobius oudemansi</i> ,
[Carpenter (= <i>Machilis maritima</i> , Oudemans).] |
| C ₁ . Subcoxæ of eighth abdominal segment ♀ produced into long pointed processes about $\frac{1}{3}$ length of stylets. Penis in ♂ projecting to about $\frac{3}{4}$ length of stylets. | <i>Petrobius vectensis</i> , sp. n. |

Genus PETROMACHILIS, nov.

The antennæ have scales only on the two basal segments (Pl. III. fig. 1a). The apex of the mandible is bluntly truncated and bears on its inner margin two minute blunt teeth (Pl. III. figs. 3 & 4). The galea of the maxilla is jointed towards the base (Pl. III. fig. 6). One pair of exsertile vesicles is present on the first abdominal segment. The abdominal segments 2–5 bear each two pairs of exsertile vesicles (Pl. IV. figs. 2, 3, 4, & 5). The sixth and seventh abdominal segments each bear one pair of exsertile vesicles. The seventh abdominal segment has the subcoxæ produced into rounded lobes, much longer in the female than in the male (Pl. IV. figs. 7 & 7a).

Petromachilis longicornis, sp. n. (Pls. III., IV., & V.)

Length of the body 10 mm. (female). Feelers and tail-process much longer than the body. In segmentation of feelers the segments are arranged in groups of 12-14 (Pl. III. fig. 1 *b*). The ocelli are dumbbell-shaped and about a quarter of a transverse diameter of an eye apart. The median ocellus is semicircular in form, with straight anterior edge (Pl. III. fig. 2). Maxilla with lacinia slightly shorter than galea (Pl. III. figs. 6 & 6 *a*). Palp of maxilla having its six elongate segments with proportional lengths 6:6:6:8·5:7·5:5·5; antepenultimate segment markedly swollen distally (Pl. III. fig. 6). The last two segments of the maxillary palp present a tapering appearance. The abdominal segments 2-5 bear each two pairs of exsertile vesicles (Pl. IV. figs. 2, 3, 4, & 5). In the eighth and ninth abdominal segments of the female the processes of the ovipositor have fifty-two segments, each carrying one strong hair on outer margins, and each segment also bearing a whorl of smaller hairs. Gonapophyses on eighth abdominal segment of the male project from mid-line of subcoxæ to about $\frac{3}{4}$ length of stylets of that segment. In the ninth abdominal segment of the male the subcoxæ are produced into very small pointed processes; the gonapophyses do not reach the tips of the subcoxæ, stylets long, relatively stout, and with acute apical spines; penis short, only projecting to $\frac{1}{3}$ length of stylets (Pl. V. fig. 9 *a*).

Loc. (1) Wasdale Head, Cumberland; collected by Mr. J. W. Shoebottom, Aug. 1911. (2) Caldey Is., Pembrokeshire, South Wales; collected by Mr. P. A. Buxton, June 1914.

In forwarding his specimens, Mr. Shoebottom mentioned that he found them beneath the top stones of a wall around Wasdale Head House, close to the upper end of Wastwater and the foot of Scafell. The locality of Mr. Buxton's specimens (Caldey Island, off South Wales) suggests that this species may be widely distributed in the remoter parts of Great Britain.

REFERENCES.

- 1913.—CARPENTER, G. H. "The Irish Species of *Petrobius*." Irish Naturalist, vol. xxii.
 1886.—OUDEMANS, J. T. "Beiträge zur Kenntniss der Thysanuren und Collembolen." Bijdr. tot de Dierkunde. (Amsterdam.)
 1809.—LEACH, W. E. Article "Entomology" in Brewster's 'Edinburgh Encyclopædia,' ix.
 1873.—LIEBOCK, J. 'Monograph of the Collembola and Thysanura.' Ray Society.

- 1904.—SILVESTRI, F. "Nuovi Generi e Specie di Machilidæ." Redia, vol. ii.
 1910.—VERHOEFF, K. W. "Ueber Felsenspringer, Machiloidea, 4 Aufsatz: Systematik und Orthomorphose." Zool. Anzeiger, xxxvi.

EXPLANATION OF THE PLATES.

PLATE I.

Structural details of *Petrobius vectensis*.

- Fig.* 1. Lateral (right) view of insect, ♀. × 12.
Fig. 2. Diagram showing shapes and positions of compound eyes (*e*), lateral ocelli (*o*), and median ocellus (*mo*). × 30.
Fig. 3. Right mandible of female, hinder aspect. *c*, condyle; *a*, apex; *m*, molar area. × 62.
Fig. 4. Terminal region of same mandible. *a*, apex; *m*, molar area. × 124.
Fig. 5. Left maxillula, hinder aspect. *l*, lacinia; *g*, galea; *p*, palp. × 124.
Fig. 6. Right maxilla of female, hinder aspect. *c*, cardo; *st*, stipes; *l*, lacinia; *g*, galea; *p*, palp. × 62.
Fig. 6A. Head of lacinia of same maxilla, showing apex (*a*), "brush" (*b*), and acute processes (*c* and *d*). × 280.
Fig. 7. Labium of female. *m*, submentum; *l*, mentum; *p*, palp. × 62.
Fig. 7A. Sensory spines from apex of labium. × 280.

PLATE II.

Structural details of *Petrobius vectensis* (continued).

- Fig.* 1. Eighth abdominal segment, ♂, ventral aspect. *sc*, subcoxa; *st*, stylet; *s*, sternum. × 40.
Fig. 2. Ninth abdominal segment, ♂, ventral aspect. *sc*, subcoxa; *g*, gonapophysis; *p*, penis; *st*, stylet. × 40.
Fig. 3. Fifth abdominal segment, ♂, ventral aspect. *s*, sternum; *sc*, subcoxa; *ve*, exsertile vesicles; *st*, stylet; *m*, muscles. × 40.
Fig. 4. Eighth abdominal segment, ♀, ventral aspect. *sc*, subcoxa; *st*, stylet; *o*, process of ovipositor. × 40.
Fig. 5. Ninth abdominal segment, ♀, ventral aspect. *sc*, subcoxa; *st*, stylet; *o*, process of ovipositor. × 40.

PLATE III.

Structural details of *Petromachilis longicornis*.

- Fig.* 1. Lateral view of insect, ♀ (body-length 10 mm.). × 6.
Fig. 1A. Two basal segments of antenna. × 62.
Fig. 1B. Segments from about middle of antenna, showing grouping. × 62.
Fig. 2. Diagram showing shape and positions of compound eyes (*e*), lateral ocelli (*o*), and median ocellus (*mo*). × 62.

- Fig. 3.* Right mandible of female, hinder aspect. *a*, apex; *m*, molar area; *c*, condyle. $\times 62$.
Fig. 4. Terminal region of the same mandible, showing blunt teeth at apex (*a*). $\times 280$.
Fig. 5. Left maxillula, inner view, showing teeth on inner side of lacinia (*l*). *g*, galea. $\times 124$.
Fig. 6. Right maxilla of female, hinder aspect. *c*, cardo; *st*, stipes; *l*, lacinia; *g*, galea; *p*, palp. $\times 62$.
Fig. 6A. Head of lacinia showing apex (*a*), "brush" (*b*), and acute processes (*c* and *d*). $\times 280$.
Fig. 7. Labium of female, showing submentum (*m*) and mentum (*l*). *p*, palp. $\times 62$.
Fig. 7A. Sensory spines from apex of labium. $\times 280$.

PLATE IV.

Structural details of *Petromachilis longicornis* (continued).

- Fig. 1.* First abdominal segment, ♀, ventral aspect. *s*, sternum; *sc*, subcoxa; *ve*, exsertile vesicle. $\times 62$.
Fig. 2. Second abdominal segment, ♀, ventral aspect, showing two pairs of exsertile vesicles (*ve*). *s*, sternum; *sc*, subcoxa; *st*, stylet. $\times 62$.
Fig. 3. Third abdominal segment, ♀, ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; *ve*, exsertile vesicles. $\times 62$.
Fig. 4. Fourth abdominal segment, ♀, ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; *ve*, exsertile vesicles. $\times 62$.
Fig. 5. Fifth abdominal segment, ♀, ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; *ve*, exsertile vesicles. $\times 62$.
Fig. 6. Sixth abdominal segment, ♀, ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; one pair of exsertile vesicles (*ve*). $\times 62$.
Fig. 7. Seventh abdominal segment, ♀, ventral aspect, showing subcoxæ (*sc*) produced into prominent rounded lobes. *s*, sternum; *st*, stylet; one pair of exsertile vesicles (*ve*). $\times 62$.
Fig. 7A. Seventh abdominal segment, ♂, ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; one pair of exsertile vesicles (*ve*). $\times 62$.

PLATE V.

Structural details of *Petromachilis longicornis* (continued).

- Fig. 8.* Eighth abdominal segment, ♀, ventral aspect. *sc*, subcoxa; *st*, stylet; *o*, process of ovipositor. $\times 62$.
Fig. 8A. Eighth abdominal segment, ♂ (immature), ventral aspect. *s*, sternum; *sc*, subcoxa; *st*, stylet; *g*, gonapophysis. $\times 124$.
Fig. 9. Ninth abdominal segment, ♀, ventral aspect. *sc*, subcoxa; *st*, stylet; *o*, process of ovipositor. $\times 62$.
Fig. 9A. Ninth abdominal segment, ♂, ventral aspect. *sc*, subcoxa; *st*, stylet; *g*, gonapophysis; *p*, penis. $\times 62$.